structures of the other, although the real nature of the structures has not yet been determined.—SHIGÉO YAMANOUCHI.

Development and biology of Armillaria.—FISCHER,[6] of the Indian Forest Service, has given a brief but interesting account of the development of the fruit bodies of *Armillaria mucida* Schräd., an agaric with a very slimy outer surface, which is common in parts of Europe, growing often in dense tufts on certain of the hard-wood trees. There is a thin universal veil present from the primordium stage to the time that the fruit body is rapidly expanding, which consists of interwoven threads forming a layer two or three cells deep. In an early stage of the primordium a palisade layer of cells is formed over its convex upper surface, just underneath the universal veil. This marks off the pileus, which now begins to expand laterally, also loosening the fundamental tissue between its lower margin and the future stipe, thus providing for the gill cavity, while at the same time the development of a palisade layer is continued from the margin inward over the roof of the gill cavity to form the primordium of the hymenium. The loose fundamental tissue between the margin of the pileus and the outer surface of the stem forms the partial veil. The slime which covers the plant is formed from the mucilaginization of the outer ends of the palisade tissue on the surface of the pileus.

The writer states (p. 504) that the present reviewer "seems to accept HARTIG'S account of the development in *Armillaria mellea* as substantially correct." Thus is discretion in the matter of not prejudging a case which is under investigation rewarded! A study of the development of *Armillaria mellea* was made by the reviewer several years ago, and an account[7] of it was presented before Section G of the A. A. A. S. at the New Orleans meeting, in connection with that on *Agaricus campestris*, the latter of which was published.[8] He has been holding the work on *Armillaria mellea* for some further study to clear up some details. There is nothing in this paper on *Agaricus campestris* which can be construed as either supporting or contradicting HARTIG'S account, and the writer carefully held to neutral ground.

It is to be hoped that FISCHER will continue his studies in the Agaricaceae, and that others also may be induced to undertake similar work. But it is just as much to be desired that either good photomicrographs be used to illustrate the work, or that good drawings be made, for little praise can be given to the illustrations accompanying this otherwise creditable paper.—GEO. F. ATKINSON.

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[6] FISCHER, C. C. E., On the development of the fructification of *Armillaria mucida* Schräd. Annals of Botany **23**:503–507. *pl. 35. figs. 1–7.* 1909.

[7] ATKINSON, GEO. F., The development of *Armillaria mellea;* the development of *Agaricus campestris.* Proc. A. A. A. S. 53rd Meeting, Dec. 1905—Jan. 1906. *Ibid.* Science N. S. **23**:203. 1906.

[8] ———, The development of *Agaricus campestris.* BOT. GAZETTE **43**:215–221. *pls. 7–12.* 1906

FISCHER has also investigated the biology of *Armillaria mucida*,[9] more especially with a view to determining whether the fungus is a parasite or a saprophyte. Most writers simply state that the fungus grows on beech trees, but MASSEE records that "at High Beech, Epping Forest, ... a healthy branch of a beech having been broken off, the wound was inoculated with the spores of *A. mucida*. At the end of the second season after the inoculation the branch was killed for a considerable distance, and the sporophores of the fungus appeared in abundance." FISCHER, unwilling to accept this observation as proof that the fungus is a parasite, has attempted to infect wounds made in living beech trees with spores or with mycelium. His experiments gave negative results, so that he was unable to obtain any proof of the alleged parasitism of the fungus. On the other hand, he found that the fungus could be grown readily as a saprophyte on various substrata, such as bread, dead beech wood and twigs, and also upon gelatin containing beerwort, meat extract, or malt extract. The time elapsing between the sowing of the spores and the ripening of the fruit bodies in pure cultures varied from 51 to 109 days. The spores germinate readily in water as well as in various culture media. FISCHER'S inoculations were carried out on thin branches. Possibly, if stouter branches containing older wood had been used, positive results might have been obtained. So far, however, there does not seem to be any clear evidence that the mycelium of *A. mucida* can kill the living parenchyma and medullary ray cells in beech wood.

FISCHER states that a spore, after arising somewhat laterally on its sterigma, "only assumes the central position later on as it approaches maturity." The figure given of the mature basidium does not support the statement that the spore is situated symmetrically over the sterigma. If FISCHER'S observation is correct, then *Armillaria mucida* is a marked exception to the general rule for the position of the mature spores in Hymenomycetes. There is one misquotation, doubtless due to a printer's error, from a paper by the writer. The number of spores that I found to have been produced from a large fruit body of *Polyporus squamosus* was 11,112,500,000, and not 11,112,500 as stated.[10] FISCHER urges that since the number of spores produced from a fruit body is so vast, wounds on trees must often become infected, and that stumps or timber infected with *Armillaria mucida*, as well as its fruit bodies, should be destroyed when possible. It may be added that eleven thousand million spores would be sufficient to provide one for each square inch in nearly three square miles of level ground.—A. H. REGINALD BULLER.

Chemotropism of pollen tubes.—In 1889 MOLISCH showed that pollen tubes grow toward pieces of the stigma (chemotropism), and grow away from the edge of a cover-glass preparation (aerotropism). Five years later MIYOSHI found that

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9 FISCHER, C. C. E., The biology of *Armillaria mucida* Schräder. Annals of Botany **23**:515–535. *pls. 36, 37.* 1909.

10 BULLER, A. H. R., The biology of *Polyporus squamosus* Huds., a timber-destroying fungus. Jour. Econ. Biol. **1**:114. *fig. 6.* 1906; also Researches on Fungi. Part I, chap. 5, 1909. London: Longmans, Green & Co.